REMARKS

Claims 1, 3, 5, 7, 9, 11, and 14-27 are pending in the application. By this amendment, all pending claims are cancelled in favor of new claims 29-42. (Claim 28 was cancelled previously; therefore, the new claims begin with claim 29.) Applicant requests reconsideration and allowance in view of the above amendments and the following remarks.

Retraction of Certain Statements

As an initial matter, Applicant notes that there are certain statements or assertions in the Remarks section of the previous Response that, upon reconsideration, need to be retracted as incorrect. In particular, the assertion at pages 10 and 11 of the previous Response that the term "S" used in the equations at paragraphs [0093] and [0094] is stress, or strain caused by such stress, is incorrect. As is evident from the relevant specification amendments above, the term S was used to indicate a summation function, namely 1/C1 times the summation of one argument (for curve P) or 1/C2 times the summation of another argument (for curve O). Furthermore, the argument at pages 14 and 15 of the previous Response suggesting that the claimed invention relies on direct measurement of temperature is incorrect. As the Examiner correctly notes in the Response to Arguments section of the current Office Action, such an interpretation of the claims is not supported by the specification. Rather, the claimed invention utilizes certain calculations to assess temperature and associated damage. Applicant reserves the right to correct any other statements in the previous Response should the need arise.

Information Disclosure Statement

The Office Action indicates that the documents submitted with the Information Disclosure Statement filed January 23, 2008 have been placed in the file but have not been considered because the Information Disclosure Statement did not explain the relevance of the second listed item of Non-Patent Literature. Applicant has corrected the Information Disclosure Statement and is resubmitting it with this Response. Because, according to the Office Action, the references have been placed in the application file (and are already available in PAIR), they are not being resubmitted with the corrected Information Disclosure Statement.

Drawing Objections

The Drawings are objected to once again on the basis that the label of the Y-axis in Figures 2 and 3 is incorrect. Applicant has re-reviewed the application, reconsidered the response to the previous objection based on that re-review, and concluded that the objection is proper. Applicant has corrected Figures 2 and 3 accordingly. Additionally, Applicant has changed "0,5" along the X-axis (European notation) to "0.5" (U.S. notation). Replacement Sheets are being filed with this Response. Accordingly, Applicant submits that the objection is overcome.

Specification Objections

The replacement paragraphs filed on May 24, 2007 are objected to for certain errors. Applicant has corrected those errors. Additionally, Applicant has amended various other paragraphs for clarity of presentation of the invention and/or to state explicitly features that are shown in the Figures. Applicant submits that these specification amendments do not introduce any new matter. Accordingly, Applicant requests that they entered.

Rejections Under 35 U.S.C. § 112

Claims 1, 3, 5, 7, 9, 11, and 14-27 are rejected under **35 U.S.C. § 112, first paragraph**, as allegedly not enabled. According to the Office Action, one of skill in the art would not know how to "utilize[e] the values for the total temperature as a measure of said damage" as recited in the claims because in the equations for the damage values D1 and D2 in paragraphs [0093] and [0094], respectively, the variable "S" has not been defined, whereas "S" is used elsewhere in the specification to represent thickness of the rotary member.

Precisely speaking, the rejection is moot because all pending claims have been cancelled in favor of the newly presented claims. However, because the newly presented claims might be rejected on the same basis, Applicant notes that the mathematical manipulations and substitutions that lead from the expressions for the total number of cycles to failure N for any given loading range recited in paragraphs **[0086]** and **[0087]** to the expressions for damage D1 and D2 recited in paragraphs **[0093]** and **[0094]** have now been made explicit. From that more explicit recitation of the expressions for D1 and D2, it becomes clear that the term S was used to

indicate a summation function, namely 1/C1 times the summation of one argument (for curve P) or 1/C2 times the summation of another argument (for curve O). Additionally, failure to superscript the terms m1 and m2 in paragraphs **[0093]** and **[0094]** has been corrected. Because paragraph **[0092]** specifically refers to a linear part damage theory, i.e., a Palmgren-Miner approach to calculating damage, Applicant submits that such amendment merely makes explicit that which one of skill in the art would have understood implicitly and therefore does not introduce any new matter into the specification. Accordingly, Applicant requests that the rejection be withdrawn.

Furthermore, claims 1, 3, 5, 7, 9, 11, and 14-27 are rejected under **35 U.S.C. § 112, second paragraph**, because certain language in the claims is deemed to be vague and indefinite and other language in the claims lacks antecedent basis. Because all pending claims have been cancelled in favor of the new claims, the rejection is, strictly speaking, moot. Moreover, Applicant has drafted the new claims for improved clarity and to better recite the claimed invention. Applicant submits that the new claims are free of such irregularities. Accordingly, Applicant requests that the rejection be withdrawn.

Art-Based Rejections

Claims 1, 3, 5, 7, 9, 11, 14-19, and 22-27 are rejected under 35 U.S.C. § 102(b) as anticipated by Hara et al., U.S. 5,723,779. Because all pending claims have been cancelled in favor of the new claims, the rejection is, strictly speaking, moot. Nevertheless, to the extent Hara might be applied against the new claims, Applicant traverses the rejection.

As is now more clearly recited in the independent claims, according to the claimed invention, a heating parameter that is based on heat-related attributes of the rotary member is calculated. (For example, when the heating parameter being relied on is the Fourier constant Fo as recited in dependent claim 30, the heat-related attributes of the rotary member are the thermal diffusivity constant of the rotary member, the thermal conductivity of the rotary member, and the heat capacity of the rotary member.) The maximum temperature for a given cycle of loading is then calculated using one function if the heating parameter is less than a predefined limit value, using another function if the heating parameter is greater than the predefined limit value, and

using either of those two functions if the heating parameter is equal to the predefined limit value (because either function will give the same result due to the fact that the predefined limit value is at their point of intersection). Accumulated damage to the rotary member can then be assessed or, complementarily stated, life remaining in the rotary member can then be predicted using a partial damage approach that is generally analogous to a Miner's Rule-based approach to assessing fatigue damage to, or predicting life remaining in, a part that is subjected to cyclical mechanical loading.

Hara, in contrast, does not disclose the concept of using different functions to determine temperature depending on the value of a heating parameter. In this regard, the most pertinent statement in the Office Action is the assertion at paragraph 12-3 (with respect to now-cancelled claim 5) that

> [r]egarding claim 5, Hara et al. further disclose wherein a constant (Fo) is calculated after every loading on the basis of both the nature of the rotary member and the loading time ($\Delta N \bullet t$, column 4, lines 6-9), in that when a calculated value of the constant lies below a predetermined limit value, a first set of functions is used, and in that when a calculated value lies above said limit value, a second set of functions is used (derived from the formulas, Temp is a function of $\Delta \bullet t$, column 3, line 62 through column 4, line 4).

Applicant disagrees with that assertion and refutes the notion that Hara discloses the claim-related concept.

In particular, according to Hara, the temperature of the clutch surface is calculated by first calculating the torque Tc transmitted by the clutch ($Tc = k_1 \bullet Pc + a_1$, where Pc is the pressure of the control oil used to actuate the clutch and k_1 and a_1 are constants); then calculating the loading energy Ec imparted to the clutch based on that torque Tc ($Ec = k_2 \bullet Tc \bullet \Delta N$, where ΔN is the differential revolution (i.e., the difference in revolution between the front and rear wheels of the vehicle in which Hara's method is being implemented; see column 1, lines 19-27 of Hara) and k_2 is a constant); and then calculating the temperature Temp of the clutch surface based on that energy Ec ($Temp = k_3 \bullet Ec \bullet t + T_{oil}$, where t is the amount of time over which the difference in rotation ΔN occurs, T_{oil} is the temperature of the control oil, and k_3 is a constant). That is a straightforward sequential calculation that leads directly from applied pressure to resulting temperature of the clutch surface, and there is no variation at all in the formulae that are used –

let alone variation in dependence on the value of a heating parameter that is based on heat-related attributes of the rotary member – to make that calculation.[3] Thus, the assertion in the Office Action is not correct.

Furthermore, there are several other features recited in various claims that Hara does not disclose. For example, claim 30 now clearly specifies the equation for determining the Fourier constant Fo as $\underline{Fo} = 4*\alpha*t/S^2$, and Hara manifestly does not disclose that parameter or equation. Thus, the statement in the Office Action quoted above that "Hara et al. further disclose wherein a constant (Fo) is calculated after every loading" is not correct, either.

Further still, claim 32 better expresses the concept reflected by Figure 3 in the application, *viz.*, that 1) for heating parameters less than the limit value, one function is used in calculating the maximum temperature for loading cycles having one loading profile (e.g., triangular) and another function is used in calculating the maximum temperature for loading cycles having another loading profile (e.g., rectangular); and 2) for heating parameters greater than the limit value, one function is used in calculating the maximum temperature for loading cycles having one loading profile (e.g., triangular) and another function is used in calculating the maximum temperature for loading cycles having another loading profile (e.g., rectangular). Or, more simply stated, the specific function used in calculating the maximum temperature depends on the loading profile of the loading cycle as well as the value of the heating parameter. With better understanding of that concept in mind, which concept is better expressed in new claim 32, it is clear that Hara does not disclose that feature. Thus, the assertion at paragraph 12-1 of the Office Action (in connection with now-cancelled claim 1) that "two sets of predetermined functions (K, L; M, N), each comprising at least one function, are used for temperature-increase calculation (formulas, column 3, line 62 through column 4, line 4)," which assertion capitalizes on previously poorer expression of the loading-profile-dependence feature, can no longer stand. So, too, is the case with respect to the assertion at paragraph 12-2 of the Office Action (in

[3] Although the first equation in Hara could be substituted into the second equation and then the so-modified second equation could be substituted into the third equation so that one could calculate temperature of the clutch surface using a single equation with all necessary variables, Applicant's point – that there is no variation in the function used to calculate temperature – remains the same.

connection with now-cancelled claim 3) that "Hara et al. further disclose wherein the time for which the rotary member (2) is applied is measured, and in the set of functions (K, L; M, N) which is used for each specific temperature-increase calculation is also selected depending on this time (measuring a loading time, column 3, lines 46-49)."

Finally, new claim 35 specifies that the maximum temperature is calculated by summing a base temperature of the rotary member and a temperature rise associated with the given cycle of heat-generating loading. The most pertinent statement in the Office Action with respect to that feature is the assertion at paragraph 12-1 (with respect to now-cancelled claim 1) that Hara discloses "calculating a total temperature in a part of the rotary member for each loading by summation of a basic temperature of the rotary member before the loading concerned and [the calculated] temperature increase[,]" and for that assertion the Examiner relies on the formula for temperature Temp of the clutch face disclosed at column 4, lines 6-9 of Hara. As noted above, however, the temperature Temp of the clutch face is calculated in Hara as $Temp = k_3 \cdot Ec \cdot t + T_{oil}$. Thus, even if for the sake of argument the first term in that equation ($k_3 \cdot Ec \cdot t$) is deemed to be a temperature increase term, the second term in that equation (T_{oil}) is the temperature of the control oil, not a base temperature of the rotary member. Thus, the assertion that Hara adds a temperature increase to a base temperature of the rotary member to determine maximum temperature is incorrect.

Thus, for at least these several reasons, Applicant traverses the rejection to the extent it might be applied against the new claims and requests that it be withdrawn.

Claims 20 and 21 are rejected under 35 U.S.C. § 103(a) based on Hara in view of Lauster et al., "Thermic Computations in Multiple-Disk Clutches," on which the Examiner relies for disclosure of accounting for cooling between loading cycles (claim 20) and measuring a temperature on the rotary member after a long time between loading intervals and using that measured temperature as the base temperature for subsequent loading interval calculations. To the extent claims 20 and 21 are cancelled, the rejection is moot. To the extent the rejection might be applied against new claim 37, which recites the cooling-accounting feature, Applicant traverses the rejection for at least the reasons set forth above that are applicable to new claim 29, from which new claim 37 ultimately depends, and requests that it be withdrawn.

In view of the foregoing, Applicant submits that all pending claims are in condition for allowance, and timely Notice to that effect is respectfully requested.

The undersigned representative requests any extension of time that may be deemed necessary to further the prosecution of this application.

The undersigned representative authorizes the Commissioner to charge any additional fees under 37 C.F.R. 1.16 or 1.17 that may be required, or credit any overpayment, to Deposit Account No. 14-1437, referencing Attorney Docket No.: 7589.0150PCUS00.

In order to facilitate the resolution of any issues or questions presented by this paper, the Examiner may directly contact the undersigned by phone to further the discussion.

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